

ANALYSIS OF PAST RECOMMENDATIONS



National Fire Coordination Study



ANALYSIS OF PAST RECOMMENDATIONS

- an analysis and summary -

REPORT AND ANALYSIS

By

William R. Moore

November 1964

Reviewed by:

John H. Dieterich

James W. Jay

Theodore G. Storey

Merle S. Lowden

Prepared by the U. S. Department of Agriculture, Forest Service,
Division of Fire Control, National Fire Coordination Study, Washington,
D. C. for the Office of Civil Defense under contract OCD-PS-64-229.

C O N T E N T S

	<u>Page</u>
INTRODUCTION	1
THE PROBLEM	2
OBJECTIVES	3
ANALYSIS	4
CONCLUSIONS	12
RECOMMENDATIONS	16
APPENDIX	17

- INTRODUCTION -

Effective July 1, 1964 the Forest Service began a National Fire Coordination Study for the Office of Civil Defense Office of the Secretary of the Army. The purpose of the study is to recommend how existing Federal, State, local and Private fire forces can be most effectively joined to cope with fires which might result from a nuclear or similar disaster. Ability to effectively cope with fires resulting from such a disaster could be closely related to the ability of the United States to survive as a Nation. Thus the recommendations and subsequent plans, policies, and procedures resulting from the National Fire Coordination Study must reflect the thinking, experience and creativity of the most capable people in the fire services and related organizations.

Much thinking, planning, research and study has already been devoted to the problem of what to do to achieve effective control of fires that might occur from a nuclear attack or natural disaster. Some of this resulted in findings that can contribute to more effective fire prevention and control. Some researchers carried their thinking beyond fact finding and recommended what should be done operationally to achieve the most effective results. Some groups had a specific objective to develop operational recommendations. This paper summarizes some operational recommendations that are pertinent to the National Fire Coordination Study.

Pertinent recommendations were extracted from fifteen different reports.

These reports are listed in Exhibit A, appendix. Recommendations are grouped by functions in exhibits B, C, D, E, F, G and H of the appendix. Each recommendation is coded to Exhibit A so the reader can determine the source of the recommendation.

- THE PROBLEM -

The National Fire Coordination Study task force will prepare an analytical report as a first phase of the Study. This analytical report will be used for deciding the direction to take during the rest of the study. Among other things, the analytical report will recommend feasible alternative courses of action and cost-effectiveness and impact analysis for each alternative.

Recommending alternative courses of action for the OCD fire defense program requires synthesis and analysis of pertinent available data including:

1. Findings of pertinent Research.
2. Conclusions and recommendations from Mutual Aid and Command studies.
3. Conclusions and recommendations from the study of large fires.
4. Findings from the review of pertinent literature.
5. Effects of possible nuclear attacks on fire and resources.
6. Ideas and suggestions developed at the fire service briefing meetings.

This paper is concerned with operational recommendations extracted from items 1 and 4.

A key objective of the study team is to make full use of past studies and recommendations. Several informed fire people have expressed disappointment that earlier recommendations have not been carried out. Thus the problem is to discover pertinent past recommendations and summarize them so they can be evaluated and considered when solving problems and making decisions during this study.

- OBJECTIVES -

Objectives of this paper are to:

1. Summarize pertinent past recommendations so they can be evaluated and used during the National Fire Coordination Study.
2. Identify recommendations that have special potential and that should be studied in depth.
3. Recommend how these recommendations can best be used.

- ANALYSIS -

There are 134 recommendations. These are in seven different broad functional categories. They date from 1959 to 1964. See exhibits B, C, D, E, F, G, H, appendix. These exhibits, which group the recommendations into functional categories, are intended to sort the recommendations so the problem solver can readily relate them to his problem.

Some duplication exists in these recommendations. A few conflict with others but there is a surprising amount of agreement among them. All are important. There are some recommendations - or groups of recommendations, that suggest problems or courses of action that merit special consideration during the National Fire Coordination study. These are discussed by functional categories in the following paragraphs.

Organization, Coordination and Administrative Plans (See Exhibit B, Appendix):

These recommendations suggest that pre-emergency defense planning districts be determined by the locations of natural fire breaks. Traditional jurisdictional boundaries are to be ignored for suppression action purposes. They would still hold for organizational purposes. Other studies familiar to the analyst suggest this to be desirable. There are likely legal, legislative, and cultural barriers to surmount to achieve such a plan.

Pre-emergency planning based on accurate inventories is supported by both research and operating people. These inventories should include an assessment of the magnitude of the fire problem, fuel-type inventories and maps, fire equipment including static water supplies and trained people.

A survey of the potential people that could be trained is suggested. Also a survey of the effects of fire on functional systems such as communications and power. Self-help training to qualify individuals or teams of individuals to put out small fires in buildings before they join and create mass fires is recommended and supported by research. Such a program shows great promise.

One recommendation suggests that each fire defense plan treat four categories of operation in detail. These are; (1) Command and staff operations control down through district level, (2) traffic control primarily on a sector basis, (3) communications at all levels, and (4) logistics including radiological monitoring. This suggests to the analyst that command and staff training, based upon the actual situation and plan in each local area, will be necessary to make this work.

There are several recommendations - mostly made by fire service operational people - that suggest clearer and more effective staff and command, national to local level. These recommendations vary. They all suggest a need for: (1) Clear, effective plans for emergency command that are understood in advance, and (2) capable professional leadership in the fire field. Thus these two problems should be considered in depth in the National Fire Coordination study. The CD Act established the line of authority for Civil Defense to be; Federal Government -- Governor of the State -- Local jurisdictions. This should be considered the chain of command. Perhaps the professional fire leadership could be achieved by creating a staff chain of communication that would go more directly from the national level to the local unit.

A national fire defense plan is recommended which would include all of the existing fire services. Such a plan, if followed up with a strong training program and drills might help weld the rural, urban, suburban, and scattered government agency fire services to a single unit in times of emergency.

The Flame I Computer model -- if given more up-to-date input which will come from current research -- shows promise of giving general fire probability data following nuclear attack. The National Fire Coordination Study should evaluate the possibility of making this model operational. Its purpose could be to rapidly analyze data for top level decision makers. This could be especially effective if coupled with a nuclear detonation detection system that need not rely on traditional communication.

Some recommendations are aimed at improving preparedness at the local level by placing responsibility for disaster preparedness with existing public service organizations. These suggest that a separate agency, which operates only in time of emergency, cannot command the respect, operating capability, or support needed to function effectively. The fire study should analyze this recommendation and if it looks desirable the organization level where it should be applied should be identified.

Pre-Emergency Fire Suppression Planning and Prevention (See Exhibit C. Appendix):

Community prevention programs, including inspection by fire experts, is recommended. These programs should be done by an enlightened public that understands the nuclear fire problem and the importance of ignition points. This suggests a public education program.

Planning cities for fire prevention so they can be defended from fire is important. This suggests a national policy for urban planning.

Fire Tactics & Equipment (See Exhibit D, Appendix):

Achieving interchangeability of fire equipment through standardization or adaptation is given much attention. There are many obstacles to surmount to achieve this. Perhaps we should identify the key items to be standardized. Are hose threads the key? Are there others? If so, what are they?

Application of infrared detection and mapping systems to reconnaissance and control of fires was recommended in 1962. Research has progressed in this field and this technique is nearly ready for operational use. The operational task is to decide how much equipment is needed, where it should be, and who will operate it during an emergency. This raises the deeper questions of responsibility for tactical and strategic aerial reconnaissance to survey fire damage following an attack. The Fire Coordination Study should consider this responsibility and make recommendations as needed.

Shelter Location & Protection (See Exhibit E, Appendix):

Key points in these recommendations are; (1) Develop methods to seal shelters from smoke and gas, (2) develop protection from fire measures to be taken by shelter inhabitants, (3) locate shelters in cleared areas away from fuels, and (4) determine hazard reduction measures needed around existing shelters. These suggest to the analyst that many existing shelters may be untenable from a fire standpoint.

Training (See Exhibit F, Appendix):

The fire services recommended in 1960 that national level staff and command fire schools be conducted annually. This recommendation was started and much good came from it.

A composite of several training recommendations suggest that operational staff and command training is needed on a more localized basis than has been heretofore typically conducted. Several others suggest that radio-logical monitoring capabilities must be developed in the fire services. This seems elemental, if only to prepare fire control officers to decide when their men can be exposed and when they must take shelter.

Cataloging fire training materials to make them available to all fire services could have far reaching benefits. This could be one task of professional leadership in a national to local chain of communication.

Additional Research (See Exhibit G, Appendix):

Examining urban areas in the U.S. to determine the probability that fire storms would develop has potential value. Especially so if this information can be related to the Flame 1 model and to a nuclear detonation detection device. Such an examination should go further and identify the adjacent rural fuels that might be a hazard.

Much large-fire research is in a stage where laboratory experiments must be tested under near actual conditions. Large test fires are indicated and recommended.

A composite of recommendations about further research suggests that a balanced program is possible in research on rural fires and on urban fires. There are no recommendations for research or studies to determine the relationships between fire suppression in these two areas. What are the similarities? What are the differences? How do fuels in one influence fire in the other? Such research might contribute toward a better joint utilization of rural and urban fire forces.

47 of the 134 recommendations in this report suggest additional research. The analyst reviewed several research papers that did not contain operational recommendations. Converting research findings to operational action is a continuing and professional task. The analyst suggests that more be done in this area. This could be the No. 1 priority job of the professional fire staff mentioned earlier.

General (See Exhibit H, Appendix):

The fire services recommended in 1960 that existing classified information on the thermal effects of nuclear weapons be declassified and made available to the fire service. This must have been done because at least 90% of the research used in this study thus far has been unclassified. It is likely that the fire services would benefit by having more realistic data on the scope and magnitude of an attack which they might experience. The National Fire Coordination Study should seek ways to inform the fire services about this within the framework of security classification.

- CONCLUSIONS -

Having analyzed the 134 recommendations we conclude that these can be reduced to 24 which should be given special study and evaluation in the National Fire Coordination Study. Some are single original recommendations made by study groups or researchers. Others are composites developed by the analyst from several recommendations. A few are projections by the analyst.

1. Determine the boundaries of pre-emergency defense planning districts by the location of natural fire breaks or emergency problem areas. Ignore traditional jurisdictional boundaries for fire suppression purposes.
2. Base pre-emergency plans on accurate inventories of the magnitude of the fire problem, fuel types, fire equipment and supplies, trained people, and people potentially available for training.
3. Conduct self-help training to qualify people to put out small fires in buildings before they join and create mass fires.
4. Treat these four categories in detail in each Fire Defense Plan;
(1) Command and staff operations control down thru the district level, (2) traffic control on a sector basis, (3) communications at all levels, and (4) logistics including radiological monitoring.
5. Conduct command and staff training based upon the actual situation and plan in each local area.

6. Consider these problems in depth:
 - (1) Achieve clear, effective plans for emergency command that are understood in advance.
 - (2) Achieve capable, professional leadership in the fire field -- national to local.
7. Create a comprehensive professional fire staff Chain of Communication-- national to local -- separate from the Civil Defense Chain of Command.
8. Develop a National Fire Defense Plan that includes all of the fire services.
9. Evaluate the capability of the Flame I Computer Model for operational use to interpret post attack fire data for top level decision makers. Relate to Nuclear Detonation Detection Research and to potential fire storm areas in cities. (See Recommendation 18).
10. Place responsibility for disaster.
Preparedness with existing public service organizations at the local level.
11. If item 10 is implemented, define the organizational levels where it should be applied.
12. Implement Community Prevention Programs to include inspection by fire experts. Education of the public of the importance of ignition points to be included.
13. Plan cities so they can be defended from fire.

14. Identify the key items to be standardized to achieve interchangeability of fire equipment. Then recommend how to achieve the standardization.
15. Make infrared post attack fire detection and mapping operational.
16. Clarify who is responsible for tactical and strategic aerial reconnaissance to survey fire damage following an attack.
17. Determine what existing shelters are vulnerable to fire.
18. Examine urban areas and adjacent rural areas in the U. S. to determine where fire storms would likely develop. (See Recommendation 9).
19. Make more use of large test fires to test laboratory findings under near actual conditions.
20. Conduct research to determine the relationship between rural and urban fire suppression.
21. Develop more effective ways of converting research discoveries to operational action.
22. Develop ways to inform the fire services about the location and magnitude of an attack they could expect to receive if nuclear war occurred.

23. Catalogue fire training materials so they are available to the fire services.
24. Study the Fire Vulnerability of functional systems such as Power Industry, Agriculture, Transportation, Petroleum Industry and Communications.

- RECOMMENDATIONS -

The 134 recommendations -- these were made prior to the National Fire Coordination Study -- analyzed in this report can best be used by:

1. Relating the recommendations in Exhibits B, C, D, E, F, G, H, appendix, to functional problem-solving as the study progresses.
2. Giving the 24 recommendations listed under Conclusions section special evaluation as the study progresses.
3. Using the 24 recommendations listed under Conclusions as input data for problem-solving and relating them to the findings of other aspects of the study.

- APPENDIX -

Exhibit A - Sources of Recommendations

Exhibit B - Recommendations About Organization, Coordination and
Administrative Plans.

Exhibit C - Recommendations About Pre-emergency Fire Suppression Planning
and Prevention.

Exhibit D - Recommendations About Fire Tactics and Equipment.

Exhibit E - Recommendations About Shelter Location and Protection.

Exhibit F - Recommendations About Training.

Exhibit G - Recommendations Suggesting Additional Research.

Exhibit H - General Recommendations.

Exhibit A

SOURCES OF RECOMMENDATIONS

SOURCE CODE

SOURCE DOCUMENT

- A. "AN APPROACH TO TRANS-ATTACK FIRE SUPPRESSION IN URBAN AREAS"
by Salzberg, F., Maatman, G. L. and Vodwarka, F. H., March 1964.
(Prepared for OCD by I. I. T. Research Institute).
- B. "NUCLEAR WAR AND THE URBAN FIRE PROBLEM" by Lommasson, T. E.,
The Dikewood Corporation, DC-TN-1040-1, February 20, 1964,
Addendum No. 3 to second quarterly report, Contract OCD-PS-64-16.
- C. "FIRE EXPOSURE OF PEOPLE IN SHELTERS", Reprint, NPA Quarterly,
October 1961, by Broido, A., and McMasters, A. W., PSW Forest
and Range Experiment Station, U. S. Forest Service.
- D. "THE INFLUENCE OF A FIRE INDUCED CONVECTION COLUMN ON RADIOLOGICAL
FALLOUT PATTERNS" by Broido, A., and McMasters, A. W., Technical
Paper No. 32, PSW Forest and Range Experiment Station, U. S. Forest
Service, 1959.
- E. "INFRARED AS A FIRE CONTROL TOOL" by Hirsch, S. N., Reprint from
proceedings, Western Forestry and Conservation Association Meeting,
December 1962.
- F. "MASS FIRE AND FIRE ENVIRONMENT PROGRESS REPORT" by Countryman, C. M.,
PSW Forest and Range Experiment Station, U. S. Forest Service, OCD
Project 32 (2421E) 1964.

- G. "SYNOPTIC WEATHER TYPES ASSOCIATED WITH CRITICAL FIRE WEATHER"
by Schroder, M. J., and others, PSW Forest and Range Experiment
Station, U. S. Forest Service and U. S. Weather Bureau, 1964.
- H. "NATIONAL FIRE DEFENSE SEMINARS," Conducted by Los Angeles County
Fire Department, Iowa State University, Memphis, Tennessee Fire
Department and University of Maryland, 1960.
- I. "SHELTER FIRE VULNERABILITY - SPECIFIC FIRE LIMITING ACTIVITIES
FOR OCCUPANTS" by Varky, R. B., and Maatman, G. L., I.I.T. Research
Institute Project No. 11-6005, September 9, 1964.
- J. "A STUDY TO ANALYZE AND IMPROVE PROCEDURES FOR FIRE DAMAGE ASSESSMENT
FOLLOWING NUCLEAR ATTACK," Part 1, final report, by Jewell, W. S., and
Willoughby, A. B., Broadview Research Corp., October 1960.
- K. "FLAME I FIRE SPREAD SIMULATION MODEL" by special project branch,
Computation Center, University of North Carolina, NREC Technical
Report No. 21, January 1964.
- L. "PRIMARY INCENDIARY EFFECTS OF NUCLEAR WEAPONS" by Martin, S. M.,
Paper presented at Tripartite Technical Cooperation Program --
Thermal Symposium, October 5 - 9, 1964.
- M. "SMALL COMMUNITY FIRE FIGHTING RESOURCES FOR MAJOR FIRE DISASTERS,"
Quarterly Progress Report for Period March 15 - July 1, 1964,
Bio-Dynamics, Inc., OCD-PS-64-39.

N. "IGNITION OF FIRES AND FIRE SPREAD BY THERMAL RADIATION"

By Brown, F. W., III, U. S. Naval Civil Engineering Laboratory,
Port Hueneme, California, June 1962.

O. "SURVEY OF THE THERMAL THREAT OF NUCLEAR WEAPONS"

Unclassified version by Rogers, J. C. and Miller, T. (Stanford
Research Institute, Menlo Park, California). S.R.I. Project No.
IMU-4021 for OCD, Contract No. OCD-OS-62-135 (III), November 1963.
Second Printing May, 1964.

Exhibit B.

RECOMMENDATIONS ABOUT PRE-EMERGENCY FIRE
SUPPRESSION PLANNING & PREVENTION

<u>SOURCE CODE</u>	<u>RECOMMENDATIONS</u>	<u>DATE</u>
A	That nuclear fire defense plans consider entire urban areas ignoring traditional, county, and State lines of jurisdiction. Primary emphasis should be placed dividing the urban area into fire zones as determined by the availability of natural fire breaks.	1964
A	The urban area should be divided into sectors and these subdivided into districts. Where feasible, district boundaries should coincide with municipal limits, and sector boundaries with county or State lines.	1964
A	Set up lines of authority within each district and sector and designate at least three alternate general command posts for the entire urban area.	1964
A	As the first step, for realistic planning for fire defense, study each urban area to assess the magnitude of the fire problem.	1964
A	Inventory and catalogue all the fire defense facilities presently available within each district sector.	1964

- A Survey each district in terms of its need and potential 1964
for providing self-help and brigade fire teams. Base
the survey on the inventory, results of the fire potential
study, and the availability of civilian man-power at various
times of day and night. Local civil defense directors and
fire departments within each district should be responsible
for organizing and training their required quotas.
- A Each self-help team includes two individuals, each 1964
equipped with smoke mask, stirrup-type hand pump
extinguisher with a four-foot hose, and an adjustable
spray nozzle. Give all teams basic training and ex-
perience in the use of this equipment on room fires.
- A Each trained brigade team consists of four men, each 1964
provided with fire helmet, bunker coat, boots and
smoke mask, and a piece of trailer-type fire apparatus.
The apparatus should include one fixed and one portable
gasoline-powered pump, booster lines, suction hose, fire
hose, spray nozzles, booster tank, extension ladders,
hand tools, and stirrup pumps.
- A Organize brigade teams under the direction of local 1964
fire department officers on a district basis. Train-
ing should be handled by department personnel on a
continuing basis. Emphasis should be placed on extin-
guishing dwelling fires.

- A The fire defense operation plan should treat in detail 1964
each of four categories of operation (a) command and
staff operations control down through the district level,
(b) traffic control primarily on a sector basis, (c)
communications on all levels, and (d) logistics including
radiological monitoring.
- A Coordinate and control the implementation of self-help 1964
and brigade teams on an individual fire department
company level within each district.
- A Hold conferences throughout the country with spokesmen 1964
for the public fire service to impress upon them the
important administrative and training role which local
fire departments will have to plan leading up to and at
the time of a nuclear emergency.
- A Educate the public fire service to obtain maximum 1964
suppression effectiveness from booster and hand line
attacks so as to increase their suppression capabilities
at the time of a nuclear attack.
- K The Flame I Model is intended for and should be used 1964
for computer oriented programs.
- M That disaster preparedness reside with existing public 1964
service organizations, rather than with separate agencies
that operate only in time of disaster.

- M That fire and police departments organize the disaster 1964
planning from the standpoint of community respect and
leadership.
- M That natural disasters should be stressed from the 1964
standpoint of community need and a more favorable
reception of budget requests for disaster planning.
- M That small communities follow an established plan for 1964
pre-disaster organization to make their efforts more
effective during emergencies.
- H So that the National Fire Defense program may receive 1960
adequate guidance and coordination and assistance at
various levels, it is recommended that OCDM administra-
tive offices at National and Regional levels be staffed
with competent personnel that are trained, experienced
and skilled in the handling, organizing and directing
both structural and wildland fires in this all important
national program.

- H It is recommended that serious consideration be given 1960
to the creation of a position of National Fire Service
Command and that ample authority be provided this
position in the event of a proclaimed national state
of disaster and/or emergency to activate and execute
the current National Fire Defense Plan. Further this
position of National Fire Service Command shall be
assigned to OCDM under the immediate command of the
Director of OCDM.
- H Need for delineation of lines of authority nation-wide. 1960
- H Establish a technical line of command at national level 1960
reaching down through chain of command to local areas.
These command positions shall be filled by widely ex-
perienced personnel in the field of fire control and
administration.
- H Develop pre-plan for large scale fire control and 1960
procedures to implement them immediately in case of
national disaster.
- H Develop case problems on large scale fires for program 1960
planning.
- H A definite authority should be established by OCDM to 1960
give priority in mutual assistance or aid.

- H Mutual aid is indispensable at the local or State 1960
level in combatting peace-time fires or disasters,
but its scope must be expanded in order to control mass
fires resulting from nuclear detonations.
- H Any mutual aid plan, compact or agreement be in written 1960
form and be clearly understood by all agencies, parties
and individuals concerned.
- H That there be established a definite line of command 1960
for the fire services in civil defense from the Federal
to the local level. These would include Federal OCDM,
Regions, States, CD Operational Areas, counties, cities
or zones, and districts within the cities or zones.
- H That the fire service provide a coordinator to order 1960
the movement of men and equipment and this be done
only by the fire service representative at each level.
- H The fire service representative be on each level given 1960
above.
- H That a committee be established consisting of all 1960
interested fire defense agencies to set up pre-planning
on a national level for mass fire control. That this
committee be set up on an OCDM Regional basis to meet period-
ically to establish and keep up-to-date the pre-planning for
mass fires.

- H That standard operating procedures to cover both command and staff functions be set up. 1960
- H That a National Fire Defense Plan be organized to act in major emergency situations. 1960
- H That all existing organized fire services be a part of this plan. 1960
- H That the Office of Civil Defense Mobilization act as coordinator for the execution of the National Fire Defense Plan as they presently have the necessary authority and responsibility for development of National Fire Defense. 1960
- H That existing mutual aid agreements whether verbal or in writing be extended on a uniform pattern to encompass area-wide pacts to be subscribed to by all participating fire services in writing. 1960
- H That the National Fire Defense Mobilization Plan shall include as a high priority objective the attainment of maximum interchangeability of all available fire equipment through standardization. 1960
- H Fire coordinators at their respective levels must establish and maintain current pre-plan procedures for the emergency dispatch and employment of participating fire forces. 1960

- H Delegate the responsibility for the fire program 1960
nationally to a specific person within the directorate
for Federal assistance to actively maintain fire service
contact and implement programs that will ultimately
benefit the total Civil Defense effort.
- H Form a four or five-man working group from within a fire 1960
service to assist the person to whom the delegation has
been made, to carry out such programs as may be deemed
advisable in furtherance of the Civil Defense effort.
- H Selection of the above working groups should be people 1960
who do not have organizational, sectional or selfish
interests, that rather are professional fire service
people that can contribute materially to the program.
- H Maintain contact with the fire service through a broad 1960
advisory committee such as a national fire defense ad-
visory committee. This would simply serve as a sounding
board and act in an advisory capacity.
- H That sufficient qualified fire service personnel be 1960
appointed to National and Regional levels of OCDM to
coordinate fire service activities which can be expected
in time of major disaster.

- | | | |
|---|---|------|
| H | That a detailed operational Command Plan, using Annex 21 as a guide, be set up in each State to facilitate fire service operations. | 1960 |
| H | Recommend to National Fire Defense Committee that qualifications for various levels of command be established. | 1960 |
| H | Carry out a coordinated Nation-wide fire equipment and development program. | 1960 |

Exhibit C

RECOMMENDATIONS ABOUT PRE-EMERGENCY FIRE
SUPPRESSION PLANNING AND PREVENTION

<u>SOURCE CODE</u>	<u>RECOMMENDATION</u>	<u>DATE</u>
L	Recommend the use of able-bodied members of the population to act in a first-aid firefighting capacity immediately following an attack to minimize the number of primary fires.	1964
L	Recommend the use of trained civilian volunteer fire brigades to handle or contain larger building fires.	1964
N	Recommend the use of fire-protective coatings to reduce fire spread by radiation.	1962
N	Provide for adequate fire breaks when planning future communities (or modifying existing communities) and military installations.	1962
N	Survey existing military installations (and cities) to determine the probability of destruction by fires caused by nuclear weapons. Eliminate dangers.	1962
H	Develop a liaison plan for operations on large scale fires.	1960

- H Appoint a committee to check plans already in existence. 1960
For example, the New England State's compact and the
Los Angeles County Fire Department Coordinating Plan.
- H That communities develop an effective year-round fire 1960
prevention program aimed at mass fires and that the
responsibility for initiating planning and execution
of this program be the responsibility of the chief
fire officer of each community.
- H That in addition to the year-round fire prevention 1960
and special spring cleanup and fire prevention week
programs, there should be an inspection of all build-
ings including apartments, dwellings, commercial es-
tablishments, and industrial plants to identify
hazards that exist.
- H That evacuation plans should be written concerning 1960
procedures in evacuation of important buildings such
as hospitals, institutions, schools, hotels, and
business establishments. There is also a need for
periodic evacuation drills at each location.
- H That the fire services have the responsibility of seeing 1960
that each building and area evacuation procedure are
prepared and conform with the standard fire department
practice for handling evacuation.
- H Develop radiological monitoring capability for fire 1960
department personnel.

Exhibit D

RECOMMENDATIONS ABOUT FIRE TACTICS AND EQUIPMENT

<u>SOURCE CODE</u>	<u>RECOMMENDATION</u>	<u>DATE</u>
E	Continue application of infrared detection and mapping systems to reconnaissance and control of fires.	1962
H	Consider standardization at the National level of hose threads and other equipment used in mutual aid.	1960
H	National Fire Defense mobilization should include the attainment of a maximum interchangeability of all available fire equipment through standardization and adaption.	1960
H	Equipment and apparatus should be inventoried on a Regional basis.	1960
H	Investigate the possibility of heading equipment and manpower tools. This is to be done after attack.	1960
H	That logistics be given major consideration in handling a mass fire situation.	1960
H	That manuals on intelligence already available on this subject be utilized wherever possible. These manuals are primarily F. S. and Army manuals.	1960

Exhibit E

RECOMMENDATIONS ABOUT SHELTER LOCATION AND PROTECTION

<u>SOURCE CODE</u>	<u>RECOMMENDATION</u>	<u>DATE</u>
I	Develop materials and techniques for control of ignition of shelter building from nearby burning structures under fallout conditions.	1964
I	Recommend the selection of a fire chief for each shelter building to head fire control operations, pre-attack, and post-attack activities.	1964
I	Recommend the development of a shelter fire control planning manual.	1964
I	Recommend development of methods to seal the shelters against smoke and gas.	1964
I	Survey stocked shelters and future shelters from the standpoint of potential fire vulnerability.	1964
C	Shelters should be located in a cleared area sufficiently large that the shelter will not be covered with rubble, and locate the vent as far as possible from combustible materials.	1961

Exhibit F

RECOMMENDATIONS ABOUT TRAINING

<u>SOURCE CODE</u>	<u>RECOMMENDATION</u>	<u>DATE</u>
I	Recommend the development of a 'packaged' self-help training program for use by local fire departments.	1964
I	Develop a nationwide program of self-help fire instruction operating through local CD directors and conducted by local fire departments for the purpose of training able bodied civilians in shelter fire control.	1964
H	That training be done in establishment of communications under mass fire conditions.	1960
H	That intelligence training should be included in subject matter as it is very necessary when thinking of mass fires that could take the command post great distances from the fire scene.	1960
H	That fire services should receive some training in traffic control and evacuation, even though this is normally a police function.	1960
H	That a study course be developed to acquaint staff and command school personnel with radiological monitoring and fallout effects.	1960

- H That fire services provide for additional trained personnel and equipment to protect vacated and re-located areas 1960
- H Recommend to the Office of Civil Defense that the monitoring capability program be accelerated so that fire service personnel will receive training in peace time as well as in war time phases of firefighting operations. 1960
- H That an accelerated program of public education and training be conducted to assure that vacated areas are safe from fire and maximum measures taken to prevent fires in transit and in relocated areas. 1960
- H Conduct Servicewide fire staff and command schools at least annually. 1960
- H Recommend that in the event of a major disaster, that those who have attended the staff and command school report to the Operational Control Center for the principal purpose of observation of the techniques of the command. 1960
- H Recommend that those who have attended the staff and command school be formed into teams for the purpose of operating at a simulated disaster. Rotate assignments. 1960
- H Catalogue training materials for exchange between the fire services. 1960

RECOMMENDATIONS SUGGESTING ADDITIONAL RESEARCH

<u>SOURCE CODE</u>	<u>RECOMMENDATION</u>	<u>DATE</u>
B	Verify the source surveys of interior and exterior ignitions with data from other cities.	1964
B	Complete cost-effectiveness analysis of fire prevention and firefighting measures suggested.	1964
B	Place contracts for developing a suitable thermotropic window coating.	1964
B	Examine urban areas in the United States to ascertain the probability of development of fire storms.	1964
F	Use larger test fires to further explore and substantiate some of some of the fire behavior characteristics observed on smaller test fires.	1964
F	Investigate rate of spread of mass fires that are spreading <u>outside</u> the area where initial ignition occurs and where normal control action would have the best chance for success.	

F	Conduct additional research on:	1964
	Effects of fire pattern and ignition pattern on fire behavior.	
	Effects of long burning fires on fire behavior.	
	Effects of fire whirls on fire behavior.	
F	Make more complete utilization of research potential of large test fires.	1964
G	Continue related studies of frequency and occurrence of important weather patterns.	1964
G	Continue refinement of classification of critical types of fire weather.	1964
G	Investigate synoptic weather types that pro- duce "safe" fire weather conditions.	1964
G	Complete snow cover probability charts to include October, November, April, and May.	1964
K	Obtain better input data (fuels and weather) that is designed to fit into the Flame I model.	1964
K	Obtain fuel information for urban areas as well as rural areas.	1964
N	Improve fire protective formulations.	1962

- O OCD should use the experience and research capabilities of fire research groups where applicable but it should develop in detail its own fire research program based upon goals that lead to achievement of Civil Defense missions. 1963
- O OCD should continue to sponsor detailed studies of unknowns in specific areas. 1963
- O OCD should sponsor research on strategy and tactics of a possible attack from the standpoint of fire damage including: 1963
- Thermal effects of multiple weapons on a target area.
- Importance of timing of an attack on the parameters affecting vulnerability of the entire U. S. simultaneously.
- Importance of warning to civilians and professional firefighters.
- Effect of altitude on the thermal partitioning of energy.
- Pulse shapes of weapons particularly for the intermediate altitudes (6 to 50 miles).

O Expend further research effort on certain weapon 1963
phenomena including:

Effects of strong convection currents from mass
fires on predicted fallout patterns. Current
detailed fallout models do not consider this
effect.

Extinguishment of incipient fires by the follow-
on blast wave from large weapons.

Direct effects of atomic bursts on clouds and
fog. This effect is practically unknown.

O Do further research on the effects of actual and 1963
simulated weapon pulses on materials including:

Effects of extremely short, high-intensity
pulses such as would be experienced from a
high-altitude burst.

Effects of overlapping pulses from more than
one weapon.

In general, thermal effects on materials are well
known.

O Initiate a unified study which will consider the 1963
effects of radii of weapons, the size of cities,
and the interface between the cities and forested
areas to give an indication of the interaction be-
tween urban and rural fire susceptibility, fire
behavior, and fire defense.

- O Define more precisely the important ideas of ignition points, and ignition densities and establish through parametric studies their variation with attack parameters. Develop these quantities into factors which will apply to the ultimate aims of Civil Defense. 1963
- O Interpret mathematically and linguistically the wealth of Japanese experience with conflagrations and apply the results to the study of mass fires in the United States. 1963
- O Investigate coalescence of fires both within the areas of effects of a single nuclear weapon and between such areas in the case of attacks with more than one weapon on a target. 1963
- O Countermeasures 1963
- Development - Continue effort on the development of passive countermeasures for the entire spectrum of potential fires.
- Public Acceptance - Direct efforts toward methods for getting promising countermeasures widely accepted by the public.

This might involve more stringent legal restrictions on building densities and other construction codes and laws to allow firefighters legal protection when choosing the most effective method for attacking a fire.

- O
Study the fire vulnerability of functional systems such as the power industry, agriculture, and transportation and communication systems. Of particular importance is the susceptibility of the petroleum industry to nuclear thermal radiation, fire, and fire spread.
1963
- H
Conduct research relative to providing an alternate means of communication in the event the nuclear blast radioactive cloud disrupts radio communications.
1960
- H
Begin research on panic control.
1960
- H
Conduct more operational research for large scale or mass fires.
1960
- H
Conduct more research on construction from standpoint of area vulnerability - city layouts, urban renewal, etc.
1960
- H
Conduct research on accessibility standards (streets), particularly for emergency vehicles.
1960
- H
Conduct research on auxiliary water supplies to handle mass fires.
1960

H	Conduct research on fire defense problems associated with population relocation.	1960
H	Conduct research on fire proofing relocation areas where people would be sent during evacuation.	1960
H	Conduct research to help determine, in advance, protection priorities for buildings, or areas, or other strategic metropolitan complexes.	1960
H	Conduct research on extinguishment materials and retardants.	1960
H	Conduct research on fire retardant vegetation that could be used for firebreak building protection.	1960
I	Develop materials and techniques for control of ignition of shelter buildings from nearby burning structures under fallout conditions.	1960
I	Develop methods to seal shelters against smoke and gas.	1960
J	Conduct additional research on method of predicting the initial ignition area in order to better predict the area of fire spread.	1960

J	Conduct additional research to determine better values for thermal yield, critical ignition energies of kindling fuels, and better information on actual distribution of kindling fuels in a given area.	1960
J	Conduct additional research on the physics of large scale fire spread thru experimental field tests and modelling.	1960
J	Conduct additional research on the behavior of fire as a function of time.	1960
H	That a research program be activated immediately to supply complete guidelines needed in developing pre-fire plans for large scale operations.	1960
J	Develop post-attack methods for gathering fire damage assessment data - such as aerial photo reconnaissance.	1960
J	Develop a damage assessment system on a national level that would consider the total effect of nuclear attack on rural and urban areas.	1960

D Large scale, open air experiments should be con- 1959
ducted to establish parameters affecting fallout
pattern in the presence of fire following a nuclear
detonation.

Exhibit H

GENERAL RECOMMENDATIONS

<u>SOURCE CODE</u>	<u>RECOMMENDATION</u>	<u>DATE</u>
H	That existing classified information on the thermal effects of nuclear weapons be declassified and made available to the fire service.	1960
H	That individual exposure records of fire personnel be maintained when personnel are exposed to fallout or radioactive material.	1960
H	That fire services recognize the need and provide for coordination with other related services as police, rescue, and evacuation.	1960